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SOUTHWEST FISHERIES CENTER

MONTHLY REPORT - FEBRUARY 1984

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HONOLULU LABORATORY
LA JOLLA LABORATORY
TIBURON LABORATORY
PACIFIC ENVIRONMENTAL GROUP

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STATUS OF PUBLICATIONS

Published

Balazs, George A. 1983. Recovery records of adult green turtles observed or originally tagged at French Frigate Shoals, Northwestern Hawaiian Islands. U.S. Dep. Commer. NOAA Tech. Memo. NMFS, NOAA-TM-NMFS-SWFC-36, 42 p.

Klevezal', G.A. and Albert C. Myrick, Jr. 1984. Marks in tooth dentine of female dolphins (Genus *Stenella*) as indicators of parturition. *Journal of Mammalogy* 65(1):103-110.

In decalcified and hematoxylin-stained thin section, teeth of sexually mature female spotted dolphins (*Stenella attenuata*) often exhibit a deeply dark-stained layer (DSL) at the boundary of one or more of their annual growth layer groups. The authors compared DSL counts, made without reproductive information, to the corresponding reproductive condition in 75 females to test five hypotheses concerning the possible significance of DSLs. They found an exclusive association between DSLs and calving events. The teeth of an Hawaiian spinner dolphin, *Stenella longirostris*, labeled with tetracycline one month after giving birth to a calf in captivity, contained a dentinal DSL near the label. The number of DSLs in the dentine of a female probably indicates the minimum number of calves born to the female. In future studies DSL counts may be useful in estimating birth frequencies, year-specific birth rates, and calf mortality in odontocetes.

Shomura, Richard S. 1983. A note on tuna research activity in the U.S.A. [In Engl. and Jpn.] Proceedings of the Tuna Conference, February 3-4, 1983. Shimizu City Komenkan. Far Seas Fish. Res. Lab., Shimizu.

Squire, James L., Jr. 1983. Weight frequencies for striped marlin, Tetrapturus audax, caught off southern California. Marine Fisheries Review 45:63-67.

Approved by Center Director

Bartoo, Norman V. and Keith R. Parker. Reduction of bias generated by age-frequency estimation using the von Bertalanffy growth equation. Proceedings International Workshop on Age Determination of Oceanic Pelagic Fishes; Tuna, Billfishes and Sharks.

Brill, Richard W., Kim N. Holland, and J. Scott Ferguson. Use of ultrasonic telemetry to determine the short-term movements and residence times of tunas around fish aggregating devices. Pacific Congress on Marine Technology, University of Hawaii, Honolulu, April 24-27, 1984.

Goldberg, Stephen R. and David W.K. Au. The spawning of skipjack tuna from southwestern Brazil as determined from histological examination of ovaries. For publication in ICCAT Book.

Gooding, Reginald M. Trapping surveys for the deepwater caridean shrimps, Heterocarpus laevigatus, and H. ensifer, in the North-western Hawaiian Islands. Mar. Fish. Rev.

Graves, John E. and Andrew E. Dizon. Mitochondrial DNA genetic similarity of Atlantic and Pacific skipjack tuna and its management implications. For publication in ICCAT Book.

Harrison, Craig S. and Michael P. Seki. Trophic relationships among tropical seabirds. Chapter in: Feeding ecology of seabirds and their role in the marine ecosystem. Univ. Cambridge Press.

Hunter, John R. and Ragan Nicholl. Visual threshold for schooling in northern anchovy, Engraulis mordax. For consideration for publication in Fishery Bulletin, U.S.

Randall, John E., and Stephen Ralston. A new species of serranid fish of the genus Anthias from the Hawaiian Islands and Johnston Island. Pac. Sci.

Sumida, Barbara Y. and H. Geoffrey Moser. Food and feeding of bocaccio (Sebastes paucispinis) and comparison with Pacific hake (Merluccius productus) larvae in the California Current. For publication in CalCOFI Reports.

Administrative Reports

- Matsumoto, Walter M. 1984. Potential impact of ocean thermal energy conversion (OTEC) operation on fisheries. SWFC Admin. Rep. H-84-4.
- Seki, Michael P. 1984. Techniques for assessing the impact of ocean thermal energy conversion (OTEC) operations on fisheries. SWFC Admin. Rep. H-84-3.
- Sund, Paul N. 1984. Preliminary evaluation of albacore tuna fishing, wind, and selected variables. SWFC Admin. Rep. PEG-84-1.

Translation

- Brouard, F., R. Grandperrin, M. Kulbicki and J. Rivaton. 1983. Note on readings of daily increments observed on the otoliths of deepwater demersal fishes at Vanuatu. Office de la Recherche Scientifique et Technique Outre-Mer. Mission ORSTOM de Port-Vila. (Office of Overseas Scientific and Technical Research.) Notes et Documents d'Océanographie (Oceanography Notes and Documents) 8, 9 p. + figs. (Engl. transl. by W.G. Van Campen, 1983, 10 p., Transl. No. 88; available Southwest Fish. Cent., Natl. Mar. Fish. Serv., NOAA, Honolulu, Hawaii 96812.)

Other

- Balazs, George H. 1984. A baseline assessment of marine turtles at Johnston Atoll. Report prepared for the U.S. Army Corps of Engineers, Pacific Ocean Division, 60 p. + 42 plates.

HONOLULU LABORATORY

INSULAR RESOURCES INVESTIGATION

Papers Prepared for Seamount Workshop Reviewed

Richard N. Uchida, Leader, Insular Ecosystem Program, reviewed papers and abstracts prepared by American and Japanese scientists who will be participating in the "Workshop on the environment and resources of seamounts in the North Pacific," from March 21 to 23 in Shimizu, Japan. The papers reviewed included: "Fish and crab populations of Gulf of Alaska seamounts" by Miles S. Alton; "Seamount resources: Hypotheses and future research directions" by George W. Boehlert; "Review and current status of research on the biology and ecology of pelagic armorhead" by Robert L. Humphreys Jr., and Darryl T. Tagami; "Review and present status of handline and bottom longline fisheries for alfonso" by Michael P. Seki and Darryl T. Tagami; "Problems in assessing the pelagic armorhead stock on the central North Pacific seamounts" by Jerry A. Wetherall and Marian Y.Y. Yong; "Development and present status of Japanese trawl fisheries in the vicinity of seamounts" by Takashi Sasaki; "Oceanographic studies of seamounts" by Hajime Yamanaka (translated from the Japanese by Tamio Otsu); and "Oceanic thermohaline structure and currents in the vicinity of seamounts" by Gunnar I. Roden (abstract only).

Submersible Dives Made off Hilo, Hawaii

From January 5 to 14, Reginald M. Gooding, Fishery Biologist, and Dr. Jeffrey J. Polovina, Leader, Resource Assessment Investigation of the Mariana Archipelago, and Dr. Murray Dailey, Director of Research, Hawaiian Shrimp Company, made five dives in the Hawaii Undersea Research Laboratory submersible, Makali'i. The objectives of the dives were to attempt documenting factors responsible for variation in deepwater shrimp, Heterocarpus ensifer, catch rates between traps within a string (five traps), and to document the behavior of shrimp near the baited traps of two different designs. Additional objectives were to collect shrimp specimens from the bottom, substrate samples, and bottom water samples for later laboratory assay to determine if certain species of Vitrio bacteria, which occur on landed shrimp and are suspected to be the cause of meat deterioration in the commercial product, occur in the animal or its natural bottom environment.

The dives were made about 12 miles northeast of Hilo Harbor on the Island of Hawaii in water depths of 345-375 m (1,140-1,240 ft). A continuous video record was made and numerous still photos were taken.

Despite the loss of several traps early in the operation, much information was acquired on 1) shrimp behavior around two markedly different trap designs, 2) fishability of a trap when it lies on the bottom in other than the designed way, 3) aggregating rate of shrimps around traps, and distribution of shrimp around traps relative to the current, 4) distribution

and density of shrimp relative to substrate, 5) catch rate of shrimp relative to substrate, 6) distribution and catch rate relative to depth, 7) shrimp aggression and cannibalism, and 8) general behavior of shrimp in their natural environment and in the area of traps and bait.

Annuli Counts on Hard Parts Agree with
Daily Increment Counts on Sagittae

James H. Uchiyama, Fishery Biologist, and research assistant Jeffrey D. Sampaga completed examination of the hard parts of five pelagic armorhead, Pentaceros richardsoni. Counts of annuli on the sagittae, vertebral centrum, and spines of dorsal, anal, and pelvic fins on each fish were quite consistent. Marks were also seen on the hypural and the maxilla. No marks were seen on cross sections of fin rays, the opercle, preopercle, and scales. Estimates of age by counting annuli agreed with estimates of age by daily counts on sagittae.

* * * * *

Richard Uchida revised the manuscript, "Groundfish fisheries and research in the vicinity of seamounts in the North Pacific Ocean," which he coauthored with research assistant Darryl T. Tagami. The paper has been accepted for publication in Marine Fisheries Review. Uchida also reviewed the following reports and manuscripts: "Draft final report on the potential impact of OTEC on fisheries" by the Office of Ocean Minerals and Energy; "Hawaiian ocean experiment," a position paper prepared by Dr. Lorenz Magaard; Townsend Cromwell cruise 83-02 Narrative Report by Robert L. Humphreys, Jr.; "Draft assessment of resources, existing and potential fisheries, and management needs for selected crustacean species in the western Pacific" by Paul Bartram.

FISHERY MANAGEMENT RESEARCH PROGRAM

Reports on Recreational Fisheries Revised

Thomas S. Hida, Fishery Biologist, redrafted a report on fish catch data appearing in Hawaii Fishing News and began a revision of a report on the catch and operations of the charter fishing vessel Mele Moku using the captain's personal daily log and the log submitted to the Harbor Master at Hickam Air Force Base. Research assistant Nathaniel T. Shippen provided an alphabetical listing of all boats that made recreational catches and summarized the weight frequency distribution of blue marlin from the Kailua-Kona area as reported in Hawaii Fishing News from 1979 through 1982.

PELAGIC RESOURCES INVESTIGATION

Physiological Reactions of Tunas to Strenuous Exercise Studied

Dr. Richard W. Brill, Leader, Experimental Ecology of Tunas Program, reports that he and Dr. David Jones of the Department of Zoology, University of British Columbia, have been conducting a series of experiments designed to elucidate the physiological reactions of tuna to strenuous exercise. Dr. Brill and Dr. Jones have developed techniques to successfully anesthetize tuna with a water soluble anesthetic, insert catheters into the ventral and dorsal aortas, revive the fish and return them to a holding tank, and then obtain arterial and venous blood samples from slowly swimming fish. This blood sampling technique permits the determination of normal blood oxygen, carbon dioxide, and pH (acid-base status) of tuna. The ultimate objective of this work is to determine the effects of strenuous exercise that may be relevant to the underlying causes of burnt tuna.

Studies on Nutrition, Survival, and Growth of Larval Mahi Mahi Continue

Thomas K. Kazama, Fishery Biologist, research assistant Linda A. Barraclough, and Andy Ayers, Graduate Student, University of Hawaii (UH), continued studies to determine the nutritional value of the three species of algae, Chaetacerus gracilis, Isochrysis galbana, and Tetraeselmis chuii, currently used in the larval rearing project. These algae are used as food for rotifer, Branchionus plicatilis, brine shrimp, Artemia spp., and copepods, Euterpina acutifrons and Tigriopus sp., which, in turn, are used as food for the larvae of mahi mahi, Coryphaena hippurus. Biochemical aspects of these food sources and the growth and survival of the mahi mahi larvae are being evaluated.

Rearing trials on mahi mahi larvae were also continued to test the feasibility of utilizing 100-liter tanks for replicate rearing trials. The adult mahi mahi currently being maintained at the Kewalo Research Facility (two females and one male) continued to spawn between 1500 and 1630 every other day. Each of the females has spawned 30 times since the first recorded spawning in December. Egg viability (hatching rate) has continued at better than 80%.

Preparations Made to Resume Tuna Tracking Project

The research vessel, Kaahale'ale, was hauled out during the month to replace the worn-out propeller shaft bearings. While out of the water, the boat's hull and bottom were repainted, the generator head gasket replaced, and the propeller shaft realigned. The boat was returned to the water last week and the tuna tracking project is scheduled to resume this week.

Resource Survey Cruise in the Marianas Completed

Honolulu Laboratory completed another survey cruise to the Marianas in late February on the Townsend Cromwell. Scientists on the staff of the Honolulu Laboratory have been studying a variety of deepwater snappers, and shrimps as well as the shallower schooling akule or mackerel scad. The cruise lasted 6 weeks and included stops to Guam, Esmeralda Bank, Alamagan, Saipan, Sarigan, Pagan, Agrihan and an unnamed seamount, 150 miles west of Guguan. Researchers from the Honolulu Laboratory and from the University of Guam's Marine Laboratory participated in the resource survey.

According to Stephen Ralston, Chief Scientist on this cruise, the results of deep-sea handline fishing for various species of snappers and groupers showed that each island and bank had its own distinctive community of fish. For example, the percentage contribution of gindai (a type of snapper) in the catch varied from a high of 72% at Pagan to a low of 10% at Esmeralda Bank. This species was the most frequently caught fish and made up slightly more than half of all bottom fish caught.

Not only did catches change from place to place, (averaging overall three fish per line each hour fished) but there was a notable change in catch from this year's survey compared to that of the previous year. During the summer of 1982 the highly desirable onaga accounted for only 2% of the catch at Alamagan Island whereas during this most recent winter survey it comprised more than 17% of the total catch at the same site. This variation may be due to a seasonal occurrence of this species and will be a subject of further investigation by scientists at the Honolulu Laboratory.

One of the more notable accomplishments of the cruise was the completion of an intensive fishing experiment on a species of deepwater shrimp at Alamagan. The scientists on the Cromwell repeatedly set strings of shrimp traps in one very localized area over a 16-day period, and observed a decline in overall catch rate (3.4 to 1.8 kg per trap per night). Results from this study have been analyzed and show that in the unexploited condition approximately 1 ton of exploitable shrimp was found in 1 square mile of habitat. Additionally, the study allowed scientists to quantify the effectiveness of the shrimp traps in use.

Other studies conducted on the Townsend Cromwell included night-light stations to study the abundance of akule, plankton and midwater nekton trawls, temperature and current field mapping, and reconnaissance hydrographic surveys to prepare bathymetric charts of fishing sites. Ultimately, scientists at the Honolulu Laboratory hope to determine the extent of these fisheries resources in this region and then estimate their potential for future yields through commercial fishing.

In addition to Ralston, scientists from the Honolulu Laboratory participating in the cruise were Sam Pooley, Industry Economist, and research assistant Victor Honda. Cooperating scientists from the University of Guam Marine Laboratory on the cruise were Gerald Davis and Paul Gates.

LA JOLLA LABORATORY

Coastal Fisheries Resources Division

COASTAL EASTERN PACIFIC FISHERIES ENVIRONMENTAL INVESTIGATIONS

Exploratory Longline Fishing for Albacore Conducted

An albacore commercial fishing vessel, on a fuel subsidy from Saltonstall-Kennedy funds awarded to the American Fishermen's Research Foundation (AFRF), conducted exploratory longline fishing operations for albacore tuna during November and December 1983. The results of these operations are now being analyzed by La Jolla Laboratory scientists.

The vessel made 17 sets in an area 1250 miles west of Point Arguello, California. The number of hooks varied from 540 to 1712 hooks per set at targeted depths of 250 feet in and about the thermocline. A total of 25,000 pounds of albacore tuna and 3,000 pounds of bigeye was caught by the vessel. A few scattered albacore were also caught by trolling while the vessel was in transit to the longlining area. The daily longline catch ranged from 10 to 171 albacore per set with a mean catch rate of 6.73 albacore per 100 hooks, and 6.99 tuna per 100 hooks when bigeye were included.

The vessel used monofilament nylon for both mainline and gangion construction. It used short gangions of 5 feet and set 16 hooks per basket of gear. An analysis of set and haul rates shows that using the shorter gear a complete set of 1500 hooks would take 13 hours and 21 minutes, while standard Asian gear would take 28 hours and 45 minutes.

The mean catch rate of 6.99 tuna per 100 hooks on this vessel was higher than the catch rate for any former charter vessel and also exceeds the highest rates published by the Japanese for this area and season. Experiments last year had shown that uses of this type of mainline resulted in a 62% increase in catch rate over nylon or polypropylene mainline.

Analysis of fish distribution along the mainline indicates that the vessel was setting the line above and within the thermocline. Using sag estimates of 20% of basket length, the gear was fishing from 156 to 350 feet in depth, around a thermocline depth estimated to begin at 250 feet. Winds in excess of 20 knots were encountered during one-third of the survey period. These inclement weather conditions reduced the fishing efforts of the vessel by reducing the number of hooks set in rough weather.

The goal of these studies is to evaluate the potential for establishing a U.S. fishery on albacore during winter months in eastern North Pacific waters. The purposes of this study were: 1) to conduct exploratory fishing using

longline fishing methods to determine if sufficient catches of albacore could be made to support an expansion of the U.S. fishery, 2) to make scientific observations to determine oceanographic conditions that may influence albacore distribution and catchability in the area, and 3) to collect scientific data for biology and fishery studies. The scientific observations included: (a) vertical temperature profiles and temperature measurements of the ocean surface, (b) albacore tagging for migration and stock structure studies, (c) collection of detailed records on fish catch, and amount and type of gear fished, modifications made to fishing gear and fishing tactics and size composition of tuna caught.

This study was conducted cooperatively between the National Marine Fisheries Service, Southwest Fisheries Center (SWFC) in La Jolla, California, and the U.S. albacore fishing industry's American Fishermen's Research Foundation (AFRF). Saltonstall-Kennedy funds managed by the NMFS Southwest Regional Office in Terminal Island, California, and awarded to the AFRF were used to defray fuel expenses of the vessels. The operational aspects of the study were carried on by the AFRF and managed by the Western Fishboat Owner's Association (WFOA), a west coast association of albacore fishermen. Fishery scientists at the SWFC under the direction of Dr. R. Michael Laurs planned the study and worked with the AFRF and WFOA to organize it. In addition, the SWFC provided scientific equipment. Fishery scientists were aboard the subsidized fishing vessel to make scientific observations and to keep detailed records related to the fishing operations and catch.

Information on the North Pacific Albacore Presented to Fishermen

Dr. R. Michael Laurs gave several presentations on results from recent albacore research studies to fishermen groups, including Board of Directors Meeting of the American Fishermens Association. Highlighted in the talks was new information about the North Pacific albacore resource that was the result of the cooperative NMFS/AFRF albacore tagging program. This information has been useful in the development of new fishing areas for U.S. fishermen, in providing new understanding about albacore migration and stock structure, and in age and growth studies. During the program, which started in 1971, nearly 21,000 albacore have been tagged and released. Over 1200 tagged albacore have been recovered after being at liberty from a few days to over 5 years.

AFRF plans to continue providing for the tagging program. According to Dr. Laurs, tagging this year will concentrate on obtaining information on the routes and rates of albacore migration from central Pacific to coastal waters off the Pacific Northwest. Approximately 1000 albacore are targeted to be tagged and released by cooperating fishermen. Emphasis will be on tagging fish from 12 to 18 pounds in the area west of 155°N during late spring and early summer months.

Study of Satellite Measurements of Sea-surface Temperatures off Southern California

Oceanographer Ronald J. Lynn and Jan Svejksky, graduate student at Scripps Institution of Oceanography, have completed a study dealing with satellite measurements of sea-surface temperatures off southern California. During a prolonged clearing with particularly dry atmospheric conditions over the Southern California Bight, four NOAA-6 satellite overpasses at 12 hour intervals were recorded. At this same time, a research vessel measured ocean temperatures within the satellite field of view. With this data set, it is possible to evaluate recent versions of equations for estimating sea-surface temperature from satellite data and for examining short-term changes in surface temperature caused by diel variation and surface layer movement. Surface temperatures, which were calculated from data taken during a daytime overpass using two slightly different versions of a multiwindow atmospheric correction equation, match the ocean temperatures within the expected range of scatter, $\pm 0.6^{\circ}\text{C}$. One version has a mean daytime bias of $+0.5^{\circ}\text{C}$; the other has a mean daytime bias of -0.4°C . Thus the two versions differ by 0.9°C . The satellite-derived temperatures show a diel variation in the range of 0.25 to 1.0°C , while the near-surface in situ temperature measurements suggest a smaller variation, perhaps 0.2°C . The bias of calculated satellite temperatures for the nighttime overpasses are different from those for the daytime; the bias in one version is $+1.2^{\circ}\text{C}$ and in the other is $+0.4^{\circ}\text{C}$. It is suggested that these biases are caused by inherent problems in the selection and matching of satellite and ocean data sets used in determining the equation coefficients, and by poorly understood diurnal variation of the surface temperature as measured by satellite. Noise in one of the satellite data channels adds to the problem. Diurnal differences in satellite-observed surface temperatures are found to vary regionally; larger variation is found in waters that are turbid and have a shallow thermocline. Surface flow, estimated from the change in position of recognizable thermal features closely matches the calculated geostrophic velocity.

COASTAL EASTERN PACIFIC POPULATION BIOLOGY OF FISHES

Bioenergetics of Anchovy Studied

Chris Boggs, NRC Research Associate who began his year-long stay at the Center this month, reports that he plans to conduct experiments to determine growth efficiency and metabolism of northern anchovy, with the ultimate goal of monitoring feeding, growth, activity, and reproduction in natural fish populations. He has designed laboratory experiments to provide the bioenergetic relationships between growth efficiency, feeding rates, and activity. Bioenergetic determinations will be based on changes in whole animal energy content over days and weeks in order to avoid the artifacts that hamper respirometric determinations. Calories are lost in the process of digestion, egestion, and excretion; calories are used for reproduction and metabolism as well as for somatic growth. Thus, growth efficiency is expected

to vary with metabolic rate, and may also vary with ration. Large groups of healthy fish will be used and the experiments are designed to resemble, as closely as possible, natural conditions.

Bogg's review of the available information on clupeoid metabolic rates indicates that the standard (speed = 0) metabolic rates of adult northern anchovy, Pacific sardine, Atlantic menhaden, Peruvian anchovetta, and Peruvian sardine appear to be roughly similar when corrected for size (about 10 calories/g/d for 10 g fish). However, routine and active metabolic rates of clupeoids have not generally been expressed as functions of swimming speed. Routine rates estimated for 10 g clupeoids range from 1 to 3 times as high as the rate for sockeye salmon at a speed of 10 cm/s. Thus there is a need for careful work to document the relationship between swimming speed and metabolic rate in anchovy. Future investigations by Sandy Kaupp (UCSD) will relate activity levels with muscle enzymes, thus allowing estimates of activity and also metabolic rate to be made from muscle samples from the field.

During February, a flume was constructed capable of holding thousands of adult anchovies at controlled speeds ranging from 4 to 30 cm/s. The flume contains two working sections, allowing fish of the same size and previous conditioning to be examined at two speeds simultaneously. The flume is being calibrated and adjusted to improve flow characteristics. Anchovy growth and energy content will be monitored by serial sampling every three days for several weeks at each ration level and speed. At least two speeds (4 and 20 cm/s) and two ration levels (8% and 4% per day) will be included in the tests. Starvation energy losses will also be monitored at these speeds to provide a direct estimate of maintenance metabolic rates. Two other speeds (8 and 30 cm/s) will be included if time permits.

Anchovy Egg and Larval Instantaneous Mortality Rates (IMRs) Modeled

Anchovy egg and larval IMRs have been estimated using separate mortality curves. This procedure is called multi-equation model (MEM) because an individual mortality curve is constructed for each life stage. For more effective use of data and possibly a more realistic modeling, data on eggs and larvae could be included in a single estimation procedure because mortality is basically a continuous process from one life stage to the next. Maximum likelihood estimators (MLE) are examples of such procedures (see "Advances in Cohort Analysis" in this issue).

Dr. Nancy Lo, Mathematician, has developed a single estimation procedure for life-stage specific IMRs. This procedure is called single-equation model (SEM) because it allows abundance and age data of eggs and larvae to be fitted to a single mortality curve to produce egg and larval IMRs. The SEM is preferable to the MEM for some applications (e.g., simulation studies) because MEM may produce discontinuities in mortality at transitions between life stages. Moreover, use of all egg and larval data in a single model will increase the precision of the overall estimation of mortality rates, although not necessarily the precision of mortality rates at a specific stage.

The comparison of these three models (MEM, SEM, and MLEs) based on 1980-83 anchovy egg and larval data indicated that MLE provided the most precise estimates of egg IMRs, but the SEM using nonlinear regression was nearly as good as the MLE. The MEM provided the most precise estimate of larval IMRs.

Although modeling the mortality rates is the focus of this study, the single-equation model can be applied to any continuous process whose parameters are life-stage specific. For example, many allometric relations, such as growth curves, may have different instantaneous growth rates for different life stages. A single growth curve for the whole life cycle is possible using this single-equation model.

Studies on Feeding Selection and Growth of Anchovy Larvae Continued

At the onset of feeding, anchovy larvae have a small mouth, and so they select only small prey. In the laboratory, anchovy were fed Gymnodinium (a naked dinoflagellate having a width of about 50 μ m) at 50-200/ml for the initial feeding (day 3), and two days later larger prey were fed. To test for the effect of diet on growth of northern anchovy, Theilacker fed two groups of anchovies on (25/ml and 2/ml) rotifers and harpacticoid copepods (2/ml) to one group of anchovy. Because it is impossible to quantify the caloric input of Gymnodinium, the experiments began on day 5 when the larger prey can be removed from the fish stomachs, counted, measured, and subsequently be related to caloric input.

In contrast to fish eating rotifers, fish offered the copepod diet did not switch to eating larger prey on day 5. All fish fed copepods and sampled on day 5 contained Gymnodinium in their guts and 96% of these guts were full with Gymnodinium. By day 7, the incidence of anchovy eating Gymnodinium had decreased to 80%, with 10% full. Anchovy raised on the low density rotifer diet were offered prey of the same size and at a comparable prey level as those raised on the copepod diet. These laboratory experiments suggest that young anchovy are unsuccessful at capturing copepod nauplii and they augment their diets by eating Gymnodinium.

Measurements of gross growth efficiencies (weight gained by fish/weight of food eaten) give a good estimate of the ability of fish to utilize their food. Available values for growth efficiencies of other larval fish range between 10-40%, and the measurements reported here (24-40%) for anchovy feeding on rotifers are comparable (Table 1).

Table 1. Diet-induced differences in growth of northern anchovy (age 5-10 days)

Diet	Growth rate (mm/day)	Consumption ¹		Gross growth efficiency ² (%)	Assimilation ³ (%)
		(calories x10 ³)	(%)		
Rotifers					
Brachionus					
25/ml	.33	60	75-85	24-31	44-56
2/ml	.24	43	38-53	30-40	62-79
Copepods					
Tigriopus					
2/ml	.35	5	5-12 ⁴	_____	_____

1 Calories x10⁻³ consumed on day 5; percent of body weight eaten per day, days 5-10.

2 Change in fish weight / weight of food eaten.

3 Assimilation = (calories of metabolism + calories of growth) / calories consumed.

4 Based on weight of copepods eaten.

Anchovy grew faster on the copepod diet than on the rotifer diets (Table 1); however the differences were not significant. Because growth of fish raised on the three diets was similar, the assumption can be made that gross growth efficiencies and assimilation were similar. Then the caloric input from eating Gymnodinium needed to account for the observed growth (increase in fish weight) of anchovy fed the copepod diet can be calculated using a balanced energy equation: assumed assimilation X consumption (Gymnodinium + copepods) = metabolism (catabolism) + growth (anabolism). Using a caloric value of 4.2×10^{-5} cal/Gymnodinium cell, 4.9 cal/mg for ingested copepod nauplii, 5.4 cal/mg for anchovy larvae, an assumed assimilation of 60% (Table 1) and the weight-specific metabolic information Theilacker reported earlier, Theilacker calculated that 5- to 10-day-old anchovy ate between 1300 to 1700 Gymnodinium cells per day in addition to copepod nauplii.

Hunter (1981) has made direct visual observations on the number of feeding acts executed by 6- to 10-day-old anchovy fed 400 Gymnodinium cells/ml. He observed between 2-4 feeding acts/min. Feeding rates of 1.8-2.4 cells/min, which are needed to meet the above calculated estimate for daily Gymnodinium consumption are reasonable. In earlier experiments, anchovy were raised on a diet of Gymnodinium exclusively. Their growth became asymptotic by day 8; the maximum size reached was between 3.9 and 5.0 mm and the growth rate was about 0.2 mm/day. As observed in the present study, the ingestion of a few copepod nauplii in addition to Gymnodinium cells results in a growth rate of 0.35 mm/day which is comparable to a rate of 0.37 mm/day reported for wild anchovy of similar age (Kramer and Methot, 1979).

COMMERCIAL AND RECREATIONAL FISHERIES RESEARCH FOR MANAGEMENT

Fishery Simulation Prepared for Ocean Science Day

Dr. Alec MacCall coordinated preparations with Drs. Tim Smith, Pierre Kleiber, Andrew Dizon and Earl Weber for a computer simulation of fishery management for Ocean Science Day to be held at the SWFC on March 9. For the computer simulation, written by Dr. Smith, participants will form fishing companies, with each company beginning with the same number of boats. The companies will then engage in fishing, and will try to increase their wealth by investing their profits in more fishing boats. Companies will have to make decisions on whether to buy or sell boats and the appropriate level of scientific research. At the end of several simulated years of fishing, winners will be determined by their net worth and the condition of the resource. The demonstration will show how marine resources can easily be depleted in the absence of cooperation and/or management. Following the game, the coordinators will analyze the value of scientific information in optimizing management. Another application of computer simulation in fisheries will be conducted by Earl Weber, who will demonstrate the North Pacific albacore model.

Advances Made in Cohort Analysis

Dr. Richard Methot has developed a new cohort analysis technique that can be applied to a wide variety of fishery data. Standard cohort analysis is simply a calculation based on catch at age for a fishery. The new technique can use fishery catch at age data as well as survey estimates of age composition and any number of estimates of population abundance (i.e., egg and larval surveys, acoustic surveys, aerial surveys). Because several data bases are used, the ratio of data values to number of parameters is sufficient to estimate the variance of the parameter estimates.

The goodness-of-fit of the new model to the various data bases is estimated by maximizing a likelihood function. This maximization is accomplished by an iterative technique. At each iteration the program numerically calculates for each parameter the gradient (first derivative) of the likelihood function with regard to a change in the parameter. The conjugate gradient method is then used to adjust the parameters according to these gradients and the gradients in the past few iterations. For a small select set of parameters that have high levels of covariance, a more demanding technique is used. The matrix of second derivatives is also calculated, and this additional information is used in the quadratic hill-climbing technique to adjust the selected parameters. The entire program is implemented in FORTRAN on an 8-bit La Jolla Standard Microcomputer.

A subset of the complete model has been tested by a Monte Carlo analysis. This reduced model uses only an estimate of population abundance and survey estimates of age composition. The parameters are:

- 1) recruitment in each year
- 2) mortality at age one and mortality at age five that define a linear trend in age-specific mortality
- 3) reduced availability of age one and two fish to the survey
- 4) standard deviation of the logarithm of observed abundance/estimated abundance.

The model was tested on 10 realizations of a simulated population that had six age classes and 16 years of data. The standard deviation parameter was set at 0.25 (i.e., 95% of observed abundances should be in the range of 61%-164% of the true value).

The maximum likelihood program performed admirably in reproducing the parameters used to create the simulated populations (Table 1).

Table 1. Estimates of population parameters for each of 10 simulated populations.

	Mortality rate		Availability		Abundance
	age 1	age 5	age 1	age 2	error
True values	70	120	50	80	25
Initial est.	80	100	80	80	80
Final est. for run no.					
1	75	114	44	73	8
2	71	118	49	79	22
3	51	132	65	89	13
4	64	133	57	85	21
5	71	110	52	87	21
6	54	130	68	93	22
7	81	122	40	73	15
8	72	122	46	76	10
9	61	129	56	80	16
10	72	125	50	78	19
Mean of 10 runs	67.2	123.5	52.7	81.3	16.7

Convergence was slow (greater than 50 iterations) primarily because the initial recruitment estimates were set equal to a constant value. True recruitment varied randomly from 0 to 200 units; initial estimates were constant at 100. The recruitment parameters were precisely estimated and in 9

of 10 cases the ratio of true recruitment/estimated recruitment was less variable than the ratio of true abundance/observed abundance. One problem should be noted. Because high availability and high mortality of young fish tend to steepen the observed age composition, these two parameters tend to covary strongly and negatively. Therefore the program did a better job in estimating the sum of these two parameters than the value of each of them.

Future versions of the program will include a fishery database and fishery parameters (annual fishing mortality rate and age-specific availability to the fishery), incorporate ageing error, and attempt to define parameters with less covariance.

ECOLOGY AND TAXONOMY OF FISHES

"Ontogeny and Systematics of Fishes" Volume Completed

Dr. Geoffrey Moser traveled to the Southeast Fisheries Center in Miami, Florida this month to join with Dr. William Richards in the final editing of the Ahlstrom symposium volume, Ontogeny and Systematics of Fishes. Dr. Moser also wrote and completed a section of the one delinquent manuscript from the symposium on Scorpaeniformes. Moser and Richards delivered the entire manuscript to Allen Press in Lawrence, Kansas, for an estimate of printing costs. The Society of Ichthyologists and Herpetologists will advertise the book and offer it for sale before publication to cover printing costs. The Ahlstrom Memorial Symposium was held in August 1983, and featured 89 papers on the subject. The book will contain more than 800 pages.

Oceanic Fisheries Resources Division

MARINE MAMMAL MONITORING AND ASSESSMENT

Final Pre-SOPS (Status of Porpoise Stocks) Meetings Held

Two pre-SOPS panel meetings were held to review research performed by scientists working at the SWFC on specific aspects of dolphin populations in the eastern tropical Pacific Ocean (ETP). These meetings were the final in a series of three.

On February 24, panel leader Dr. William Perrin convened the pre-SOPS Panel A meeting. The following persons attended the meeting: Frank Alverson, Dr. David Au, Dr. Andrew Dizon, Dr. J. Mead, Dr. J. McGowan, Dr. Kenneth Norris, Dr. Ken Pimental and Dr. Steve Reilly. The topic of discussion was the distribution of dolphin in the ETP.

The Panel members reviewed results of research documented in two papers. Dr. David Au presented results which he and LCDR Wayne Perryman documented in, "Dolphin habitats in the eastern tropical Pacific." Analysis of fishery-independent sightings of dolphin suggests that spotted and spinner dolphin primarily inhabit tropical surface water where there is little annual variation in temperature. The distribution of this species group is centered off southern Mexico and extends west along 10°N latitude. Striped and common dolphin tend to inhabit subtropical waters, which are characterized by relatively greater seasonal change in surface temperature and seasonal upwelling. This species group occurs most often off southern Central America, northern South America and along the equator. Distribution patterns for both species groups vary seasonally with changes in oceanographic characteristics of water masses. Distribution patterns for both groups suggest the existence of two major faunal communities in the ETP. In the northern areas, a community is characterized by spotted and spinner dolphins, and, in more southern areas, a community is characterized by striped and common dolphins.

Dr. Steve Reilly presented results of research documented in his "Seasonality of dolphin distribution in the ETP." Analyses tested whether or not the factors season, area, or period (defined as whether or not there was an El Nino) had an effect on relative encounter rates of purse seine vessels fishing for tropical tuna with 26 types of schools of toothed whales. Analyses for all 26 school types indicated that the effects of all factors on encounter rates were significant. For spotted dolphins alone, all factors had a significant effect; the greatest effect was that of period. Results indicate that distributions of these species vary seasonally and that distributions considering the area inhabited during any particular time should also account for whether or not an El Nino was occurring.

On February 10, panel leader Dr. Steve Reilly convened the pre-SOPS Panel B meeting to discuss models that describe the growth of populations of dolphin in the ETP. The following persons attended the meeting: Dr. Jay Barlow, Jeff Breiwick, Dr. Douglas Chapman, Dr. Andrew Dizon, Dr. Daniel Goodman, Dr. Frank Hester, Aleta Hohn and Dr. Donald Siniff.

Panel B reviewed research that was reported in five manuscripts. Reilly presented results of analysis described in the paper "Rates of increase in delphinid cetaceans," which he and Barlow wrote. Estimates of likely values of rates of increase of the size of delphinids populations were based on likely ranges of survival and fecundity rates. Leslie matrices were generated for combinations of different values of survival and fecundity and finite rates of population increase were estimated. Calculated finite rates ranged from 0.89 to 1.09.

Barlow presented results documented in "Interpreting spotted dolphin age distributions," which he and Hohn wrote. Age distributions calculated for spotted dolphins in the ETP show few animals of ages 5-15 years. Evidence suggests that this pattern is not the result of a non-stable age structure. Possible reasons for the pattern are either bias in sampling the population or errors in assigning ages by counting layers of dentine in teeth related to

variable deposition of layers. Rates of natural mortality and survival for spotted dolphins, calculated under the assumption that estimated ages are accurate, yielded higher-than-expected survival rates for adults.

Barlow presented results of his paper "Biological limits on population growth in spotted dolphins." Biological maximum rates at which populations of spotted dolphins can grow were estimated using a Leslie Matrix model. Estimates of survival rates at age for adults, calves, and yearlings and fecundity rates for adults were presented. Results suggest that the maximum growth for populations of spotted dolphins is less than 5.5% per year.

Goodman presented results of analyses documented in two papers: In the paper entitled, "Uses of the gross annual reproductive rate calculation in the spotted porpoise assessment," the use of the statistic gross annual production rate to estimate mean per-capita natural mortality in an exploited population of dolphin and then to compare rates for unexploited and exploited populations to estimate the natural rate of increase of an exploited population is discussed. Applying this procedure to two populations having different age-distributions introduces an error into results.

In this paper, "Consideration of age structure in back-projection calculations for the northern offshore spotted dolphin population," by Goodman, mathematical characteristics of age-structured back-projection estimates of age distribution and population size are discussed. Results of non-age-structured and age-structured back-projections are compared. Since fishing-related mortality of spotted dolphin is age-selective, the effects of this mortality is greater on estimates of population size using age-structured procedures.

MARINE MAMMAL BIOLOGY

Manuscript Completed on Bowhead Aging Technique

Dr. Al Myrick, Leader of the Marine Mammal Age Determination Project, reports that he and Mary Nerini of the National Marine Mammal Laboratory in Seattle, Washington, completed a paper describing the development of a method to estimate age of bowhead whales (*Balaena mysticetus*) from prepared thin sections of tympanic bullae. Mysticetes such as the bowhead have no teeth. The age of individuals of some mysticete species can be estimated by counting layers in the waxy earplugs. Bowhead whales do not deposit ear-plug layers, but by a special preparation technique developed by Myrick to age manatees, layers in the dense shell-like tympanic bulla that surrounds the auditory capsule became quite distinct. Myrick and Nerini carried out layer counts independently in each of eight bowhead specimens. They found that in some regions of the bones there were twice as many layers as there were in other regions. The two researchers calibrated the layers in the bowhead whale

bones, using analogous layers in the tympanic bulla of dolphins whose true age was known. After undergoing in-house review at the La Jolla Laboratory the paper is to be submitted for publication as a feature article in an appropriate journal.

Preparation of Male Spinner Dolphin Tooth Sample
Begins; Age Estimation of Females Continues

Dr. Al Myrick announced this month that preparation of the female spinner dolphin tooth sample has been essentially completed and that technicians Drew Stanley, Laurie Patla, Cathy Dargan, and Louis Arnell have begun selection and preparation of tooth samples of male spinners.

Teeth of approximately 2300 individuals, representing southern and northern whitebelly and eastern spinner dolphins, will be processed as decalcified and stained thin sections for microscopic estimation of age. The age estimates will be used to describe the age structure and age-specific growth and reproductive parameters for the mortality samples of the three stocks. Myrick notes that he and fishery biologist Priscilla Sloan are almost at the half-way point in the arduous task of estimating ages for the 2200-specimen sample of female spinner dolphins.

TUNA AND BILLFISH RESOURCES PROGRAM

Status of Atlantic Tuna Fishery Sampling Program

Foreign-caught Atlantic tunas transshipped to Puerto Rico are sampled routinely for biological information by biological technician Eugene Holzapfel. Data on fork length, weight, and species composition of catches are collected. Of the 123 samples taken in 1983, 104 are from the eastern Atlantic (off the coast of Africa) and 19 are from the western Atlantic. Results of Holzapfel's sampling of catches made during 1983 are as follows:

Species and gear	# of samples	# of fish sampled	Tonnage sampled (mt)
Yellowfin			
Purse seine	22	1468	636.4
Baitboat	25	2003	379.3
Longline	1	71	1.1
Unknown	14	1071	188.7
Skipjack			
Purse seine	9	456	2641.4
Baitboat	17	862	1753.3
Unknown	2	101	117.0

Bigeye			
Purse seine	16	520	300.4
Baitboat	2	69	1.0
Unknown	7	193	52.6
Albacore			
Longline	4	200	1453.2
Unknown	3	150	938.2
Blackfin			
Baitboat	2	100	13.3
Bullet tuna			
Purse seine	1	50	180.3

During the period from January 1 to December 31, 1983, 26 size composition samples were collected under contract for the staff of the Multi-species Data Management and Fisheries Monitoring Program by the Inter-American Tropical Tuna Commission. These data were collected from seven foreign purse seiners that fished in the Caribbean Sea and transshipped their catches to Puerto Rico. A summary of these data follows:

Species	Trips sampled	# of samples	# of fish sampled
Yellowfin	7	10	500
Skipjack	7	9	452
Blackfin	4	4	119
Bigeye	2	2	6
Albacore	1	1	18

Preliminary data on length frequency of foreign-caught Atlantic tunas, from sampling of transshipments to Puerto Rico, were submitted to the International Commission for the Conservation of Atlantic Tunas (ICCAT) on March 1, 1984. The data were prepared by fisheries biologist Tod Foster.

SWFC Scientist Begins 3-Month Joint Research on Albacore with Fisheries Scientists in Japan

This week fishery biologist Dr. Norman Bartoo left the Southwest Fisheries Center to begin a 3-month joint research study on North Pacific albacore tuna with scientists at the Far Seas Fisheries Research Laboratory (FSFRL) in Shimizu, Japan. The unique research arrangement is a first for Center scientists who have maintained close links with the FSFRL for a number

of years through their joint participation in the series of North Pacific Albacore Workshops.

Dr. Bartoo and his Japanese colleagues will compile an up-to-date data base on the North Pacific albacore, combining both U.S. and Japanese fisheries data, and then perform simulation analysis evaluating the adequacy of catch size frequency sampling in parts of the Japanese fishery. During his stay Dr. Bartoo will also present a series of lectures to the Tokai University faculty on stochastic modeling and applications in fisheries.

PACIFIC ENVIRONMENTAL GROUP

Near Normal Winter Coastal Convergence Reappears After Extreme Anomalies of 1982-83 Winter

The two most widespread and intense environmental anomalies to affect the California Current system during recent decades have been the extreme warm episodes of 1957-58 and 1982-83. PEG Chief Andrew Bakun reports that both events have been characterized by extremely negative coastal upwelling index values (in some cases 2.5 to 3.5 standard deviations below the long-term monthly means), persisting through several winter months, over the entire coastal region from central California to the northern Gulf of Alaska. These two negative anomalies stand out clearly as the two most obvious perturbations in the entire 39-year upwelling index data set.

It appears that intense wind-driven shoreward transport of surface waters occurred during the winters preceding the unusually warm spring and summer. Accumulation of these surface waters against the coastal boundary would have resulted in (1) a seaward pressure gradient favoring anomalous northward (warm) advection and (2) a deepened layer of surface waters such that normal seasonal upwelling might not reach deep enough to carry cool nutrient-rich thermocline waters to the surface. Thus, an atmospheric teleconnection appears to have played a substantial role in the transmission of the El Niño effects from the tropics to the California Current and Gulf of Alaska Gyre systems.

During the present winter, the upwelling indices computed at PEG have returned to a normal range of values. Nearly normal values for December, positive anomalies during January, and negative anomalies during February combine to yield a seasonal mean that is quite close to the long-term average. Thus, regarding this particular causal process, any re-intensification of the El Niño anomaly in the coming months is not expected.

TIBURON LABORATORY

FISH COMMUNITIES INVESTIGATION

Impact of El Niño is Evident at Santa Catalina Island

Faunal changes in the nearshore habitats at Santa Catalina Island associated with unusually high water temperatures last summer remain in effect even though temperatures are now near normal. From collections made last month, investigation leader Edmund Hobson, with fishery biologists Tony Chess and Dan Howard, observed that certain temperate-zone fishes, normally prominent in these habitats, remain absent from reefs shallower than about 20 m (except on certain offshore pinnacles).

These include the rockfishes, Sebastes spp., and the surfperches: Brachyistius frenatus, Cymatogaster aggregata, Embiotoca jacksoni, Hyperprosopon argenteum, Rhacochilus toxotes, and R. vacca. On the other hand, the orangethroat pikeblenny, Chaenopsis alepidota (Figure 1), not seen in these waters by Tiburon biologists in over 20 years of observations, is now abundant. Among the crustaceans, Palaemonella holmesi, a species found mainly in the Gulf of California, is now the dominant decapod shrimp by more than 10 to 1 over Hippolyte clarki, the species that had dominated these habitats during the sampling done over the previous years.



Figure 1. Orangethroat pikeblenny, Chaenopsis alepidota.

Scientists Determine that Lingcod Stocks Are in Good Condition

In a report assessing the lingcod stock, fishery biologist Peter Adams concluded that lingcod, Ophiodon elongatus, stocks are generally in a healthy condition with the exception of stocks in Puget Sound and a few other localized stocks. The report was prepared for the Pacific Marine Fishery Council. Both commercial and sport-catch levels remained constant from the mid-50s to the mid-70s. From the mid-70s on, both commercial and sport catches have shown strong increases. Lingcod has a complex pattern of reproductive behavior. Females come into shallow rocky areas and lay egg

masses that adhere to the rock surfaces. Males fertilize the egg masses and then continue to guard them until hatching. The guardian male's protection of the egg mass (primarily from predation by embiotocids and hexagrammids) is considered essential to the survival of the eggs. Sport fishermen have learned to target on these nest-guarding males, a potential problem that could significantly reduce future stocks. This loss of reproductive capacity could be severe. There are several major research needs for lingcod. They are 1) to develop a practical method of aging and validation of that method, 2) to estimate mortality of the nest-guarding males from sport fishing, and 3) to begin a fishery sampling program. The first two, particularly, should be accomplished before lingcod stocks suffer significant decline.

Although lingcod is a relatively minor portion of total groundfish catch (4% of commercial and between 0.5 and 2% of sport), it is a species highly prized by both commercial and sport fishermen. It is of particular importance to management because it is the groundfish that is the most likely to cause conflict between commercial and sport fishermen. In fact, this conflict has already begun, with proposed closures of several areas in Oregon and Washington to commercial fishing. As the fishing effort directed at groundfish increases, the pressure on lingcod, too, will increase. Undoubtedly this will intensify these conflicts, and create a management problem out of proportion to the actual contribution of lingcod to total groundfish landings.

FISHERIES INFORMATION SYSTEMS AND AUTOMATIC DATA PROCESSING

CALFIN/PACFIN Update

A Pacific Coast Data Committee meeting was held on February 8 and 9, 1984, in San Francisco, California. With members from the states of Alaska, Oregon, Washington and California, Southwest Fisheries Center (SWFC), Southwest Region (SWR), Northwest and Alaska Fisheries Center (NWAFC), Northwest Region (NWR), the Pacific Fishery Management Council, and the Pacific Marine Fisheries Commission attending to discuss PACFIN. PACFIN is a computer-based fisheries information network supported by the states of Alaska, Washington, Oregon, and California and the NMFS. The Committee decided to add 1982 fishery landings data from Oregon, Washington, and California to the Fishery Research Information System which is located at the SWFC, La Jolla, California.

The Salmon Questionnaire was distributed to over 90 potential users of salmon data. The purpose of the questionnaire was to identify the salmon data requirements of a broad spectrum of the fishery community: commercial and recreational fishermen and industry representatives, fishery managers, administrators, researchers, economists, and other potential users of salmon data.

Scientific Staff Assesses Shipboard Computer System

Susan Iacometti, Computer Systems Programmer, and Rich Charter, Computer Specialist, were among the scientific staff on LEG I of the NOAA Ship David Starr Jordan's CalCOFI cruise from February 7 to 27. The objectives for ADP personnel on these cruises are to assess the operation of the new Molecular Supermicrocomputer 15-8 under sea-going conditions and to evaluate the ability of the system to collect data in real time. No significant hardware problems were encountered during this leg of the cruise.

Due to rough weather, the computer was purposely brought down even though there were no signs of difficulties. It will henceforth be standard operating procedure to shut down in the case of severe weather, especially when the scientists have stopped working and the ship is running for cover.

During the cruise Iacometti developed the phone directory system for the La Jolla Laboratory and three software application programs for the ship: the David Starr Jordan Payroll Overtime System, the Scientific Staff Payroll Overtime System, and the Captain's Monthly Report Form. User's guides for these systems were written.

Progress Made in the Financial Reporting System

Bob Nydam, Computer Programmer Analyst, and Rob Bistodeau, Computer Assistant, met with Ben Remington, Executive Officer, on February 3 to discuss the progress made to implement the Financial Reporting System at the SWFC. Remington provided them with the test data to test on-line data entry programs for commitment, labor, and plan. By mid-month, audit trail reports from the labor, plan, and commitment programs were submitted to Mr. Remington and Lorna Marques, Accounting Technician, for editing. The production of the essential February summary programs by the first week of March was on time. However, hardware failure on the Molecular Super-microcomputer 32X caused a total downtime of four days during the last week of February. This will cause a one-week delay in producing the February report.

Other ADP Activities

For the CalCOFI Data Management System Expansion, Ron Whyte and Doug Hammond, Data Editors, have entered all the larvae and egg identification data for the 1960 through 1965 series. Dorothy Roll continues work on data description for the CalCOFI data base files.

MISCELLANEOUS

SEMINARS

La Jolla Laboratory

- February 3 - Carlos M. Fetterolf, Executive Secretary, Great Lakes Fishery Commission, Ann Arbor, Michigan, presented a seminar entitled, "Bringing Back the Great Lakes Fishery."
- 21 - Dr. Roy Mendelssohn, Pacific Environmental Group, presented a talk "Environmental Influences on Tuna Catches in the Gulf of Guinea."
- 21-22 - Sharon Lundin, Chief, Employee Services and Staffing Branch, Western Administrative Support Center, presented a Career and Life/Work Planning Seminar at the Center.

PUBLIC AFFAIRS

Pacific Environmental Group

Paul Sund traveled to King City on February 21 and gave presentations to two senior high-school classes in American Government. Sund discussed PEG's organizational relation to the Department of Commerce and presented an overview of tuna biology and research.

PRESS RELEASE

Honolulu Laboratory

- February 21 - "Fishery Vessel Completes Resource Survey in the Marianas."

VISITORS

Honolulu Laboratory

- February 1 - Dr. Dennis Moore, Joint Institute for Marine and Atmospheric Research, NOAA, and Dr. Lorenz Magaard of the Department of Oceanography, UH, visited Richard Shomura to discuss Dr. Magaard's Hawaiian ocean experiment proposal.
- Koichi Dai, a feature writer with the Hawaii Hochi, a Honolulu Japanese language newspaper, interviewed Richard Shomura, Howard Yoshida, and Hiromichi Yatomi for information on the Honolulu Laboratory and the Townsend Cromwell research activities.
- David J. Mackett, SWFC La Jolla, met with Richard Shomura.
- 2 - Dr. Sammy Ray of Texas A&M University, Galveston, visited Richard Shomura and was given a briefing on the Laboratory's research activities by Richard Uchida.
- 6 - Dr. John Craven, Director/Chairman, Law of the Sea/Marine Council, and Gary McMurtry, Assistant Geophysicist, Hawaii Institute of Geophysics, UH, discussed the University's submersible program with Richard Shomura.
- 10 - Janet Swift of the Pacific Fishery Development Foundation, Dr. Richard Brock of the UH Sea Grant College Program, and the Hawaii Institute of Marine Biology, and Robert C. Carpenter of the Department of Resources and Development, Majuro, Marshall Islands, discussed fishery matters with Richard Shomura.
- Dr. Edward C. Creutz, Director, Dr. Frank J. Radovsky, Assistant Director, and Beatrice Burch of the Bernice P. Bishop Museum, Richard Shomura and Howard Yoshida participated in an informal ceremony to transfer the Laboratory's invertebrate collection to the Bishop Museum.
- Dr. Jack Davidson, Director, UH Sea Grant College Program; Kitty Simonds, Executive Director, WPRFMC; and Dr. Allan Marmelstein of the U.S. Fish and Wildlife Service (FWS) visited Richard Shomura to discuss the workshop on "Fate and Impact of Marine Debris," scheduled for October-November 1984.

- 13 - Michael S. Chu of MSC, Inc., met with Richard Shomura regarding a Hawaii State Department of Transportation study of Kewalo Basin.
- 15-17 - Richard Shomura had pre- and post-A-76 review discussions with Nicholas T. Conway and Barbara Hassenbohrer of Arthur Young and Company.
- 16 - Dr. James Parrish, Leader, Hawaii Cooperative Fishery Research Unit, FWS, and Pamela Bontrop of the Zoology Department, UH, visited Richard Shomura to discuss possible Master's Degree research projects for Bontrop.
- 21 - Dr. Dayton L. Alverson of Natural Resources Consultants, Seattle, Washington, and several commercial fishermen from the Northwest met with Richard Shomura, Richard Uchida, Dr. Robert A. Skillman, and Bernard M. Ito, to discuss Hawaiian fisheries.
- 27 - George Yang from the Food and Drug Administration (FDA), Washington, DC, and John Sullivan of the FDA's Seafood Production Research Center, Seattle, Washington, visited Richard Shomura.
 - Stanley Kaneshiro, National Weather Service, and James Watkins, Chief, Facilities Engineering and Management Division, visited Richard Shomura.
 - Ichiro Tsuji from the Science and Technology Agency, Office of the Japanese Prime Minister, visited Richard Uchida and Dr. George Boehlert to discuss possible cooperative marine research programs using the submersibles, Alvin and Shinkai 2000.

La Jolla Laboratory

- February 6-7 - Dr. Hans Lassen, Danish Institute for Fisheries and Marine Research, Charlottenlund, Denmark, met with members of the Coastal Division staff.
- 15 - Betty Gilman, Chief, Personnel Processing and Records Branch, WASC, visited the Center to present administrative seminars.
- 17 - Barbara Rothschild, Washington, DC, and Brian Hallman, State Department, Washington, DC, met with Director Izadore Barrett on tuna matters.
- 21-22 - Sharon Lundin, Chief, Employee Services and Staffing Branch, Western Administrative Support Center, presented a career and life-work planning seminar.

22-23 - Members of the National Data Management Committee met at the Center.

Pacific Environmental Group

- February 7 - Dr. John V. Byrne, NOAA Administrator visited the Center.
- Mr. Paul Wolff, Assistant Administrator, National Ocean Service, NOAA, visited the Center.
- Dr. William Sprigg, Deputy Director, National Climate Program Office, NOAA, visited the Center.
- Professor Christopher N.K. Mooers, Chairman, Oceanography Department, U.S. Naval Postgraduate School, visited the Center.
- 16 - Dr. Larry Breaker, U.S. Naval Postgraduate School, visited the Center.
- 17 - Dave Mackett, Program Planning Officer, SWFC La Jolla, La Jolla, California, visited the Center.

Tiburon Laboratory

- February 7 - Bernice Hammer, Dick Heiman, and Frank Henry, California Department of Fish and Game, discussed sampling programs with Bill Lenarz.
- Alice Fussfeld and Lee Miller, California Department of Fish and Game, met with Mickey Eldridge to further combine and coordinate efforts on a striped bass larval otolith study.
- Mel Odemar, California Department of Fish and Game, discussed trawl logbook data with Ed Ueber.
- 14 - John Vaughn, U.S. Navy, removed a navy buoy given to Ed Ueber by a fisherman from Half Moon Bay.
- 15 - Jan and Jim Salter, F/V Ace, discussed marketing of rock crab with Ed Ueber.
- Mike Burley met with Ed Ueber to discuss the economics of gillnetting.
- 23 - Shojiro Ichimaru, Kowa Corporation, Japan, discussed underutilized species with Sus Kato.

MEETINGS AND TRAVEL

Honolulu Laboratory

- February 1 - Laboratory Director Richard S. Shomura attended the Western Pacific Fishery Information Network Data Goals Committee meeting at the office of the Western Pacific Regional Fishery Management Council (WPRFMC).
- 1-10 - Dr. George W. Boehlert traveled to Newport, Oregon, to conduct cooperative research with Japanese investigators at the Cooperative Institute for Marine Resources Studies, Oregon State University.
- 2-3 - Richard Shomura attended the meeting of the Board of Directors, Pacific Fishery Development Foundation at the East-West Center.
- 6-7 - Honolulu Laboratory staff members Richard Shomura, Dr. Timothy Gerrodette, William G. Gilmartin, Thea C. Johanos, John R. Henderson, Richard Uchida, Dr. Jerry A. Wetherall, and Howard O. Yoshida; Dr. Douglas Chapman from the University of Washington, Seattle, Washington, and Dr. Douglas DeMaster of the SWFC La Jolla Laboratory participated in an internal Hawaiian monk seal research planning workshop in Honolulu Laboratory Conference Room.
- 8 - Richard Shomura presided at the first meeting of the steering group which is planning the workshop on "Fate and Impact of Marine Debris." The members of the steering group are Jim Branson, Dr. Douglas Chapman, Dr. Jack Davidson, Dr. Charles Fowler, Fredrick Wathne, and Richard Shomura. Observers at the meeting were: Robert Iversen and Eugene Nitta of the Western Pacific Program Office, Southwest Region, Kitty Simonds (WPRFMC), Dr. Charles Karnella from NMFS, Washington, DC, and John R. Henderson and Howard Yoshida.

La Jolla Laboratory

- February 1-4 - Dr. Gary Sakagawa traveled to Rosslyn, Virginia, to serve on a Peer Review Panel of the Stock Assessment Collaborative Research Support Program of the U.S. Agency for International Development.
- 5-7 - Doug DeMaster traveled to Honolulu, Hawaii, to meet with Monk Seal Planning Team.

- 6-8 - David Mackett, traveled to Honolulu to facilitate planning meeting for monk seal research.
- 6-10 - Sandy Hawes and Larry Hansen traveled to Santa Barbara Island, California, to census elephant seals and sea lions, tag elephant seals and collect sea lion scats.
- 7-10 - Dr. David Au attended the Bluefin Tuna Workshop at the SEFC in Miami, Florida.
- 8 - Izadore Barrett and Dan Huppert traveled to San Francisco, California, to attend the Pacific Coast Fisheries Data Committee meeting.
- 8-9 - Fred Kellenberger traveled to San Francisco, California, to attend the Pacific Coast Fisheries Data Committee meeting.
- 9-13 - Richard Methot traveled to Seattle, Washington, to present seminars on anchovy recruitment research.
- 13 - Drs. Izadore Barrett and Reuben Lasker attended a luncheon to celebrate the birthday of SIO Director, William Nierenberg.
- 13-28 - Doug DeMaster traveled to Santa Barbara, California, to meet with sanctuary personnel regarding new Sea Life Center, and to San Miguel Island to tag/census elephant seals.
- 14 - John Carr attended an A-76 Mid-term Review Meeting.
- 14-15 - Dan Huppert traveled to Tiburon, California, to attend meeting of Pacific Coast Groundfish Planning Committee.
- 14-16 - Izadore Barrett traveled to Tiburon, California, to participate in Groundfish Strategic Planning Meeting.
- 14-17 - Lillian Vlymen traveled to Tiburon, California, to participate in Groundfish Strategic Planning Meeting.
- 14-17 - David Mackett traveled to Tiburon, California, to facilitate NMFS West Coast Strategic Planning Meeting for Groundfish Program; and to Monterey, California, to attend Albacore Program Planning Meeting.
- 14-21 - Chuck Oliver traveled to San Miguel Island, California, to assist in the tagging of elephant seals.
- 16-20 - Jeanne Wexler traveled to San Clemente Island, California, to perform counts, tag resights and scat collections on sea lions at San Clemente Island.

- 21 - Dr. Barrett attended the opening session of the National Data Management Committee meeting at the SWFC.
- Alec MacCall met with California Fish and Game Commissioner Abel C. Galletti and with California Department Fish and Game scientists regarding status of Pacific mackerel.
- 23-27 - Lisa Ankenbrandt traveled to San Clemente Island, California, to assist in counts, tag resights and scat collections on sea lions.
- 24-29 - Robert Owen traveled to Pt. Hueneme, California, to meet the David Starr Jordan to set up Southern California Bight experiments, and to Santa Barbara, California, to consult with Drs. Smith and Robison, University of California, Santa Barbara.

Tiburon Laboratory

- February 8 - Norman Abramson and Edward Ueber attended a meeting of the Pacific Coast Data Committee at Millbrae, California.
- 15-16 - A strategic planning workshop on NMFS groundfish activities was held at the Tiburon Laboratory. Attending were: Norm Abramson, Mickey Eldridge, John Greeley, Sus Kato, Bill Lenarz, and Jeannette Whipple, NMFS, Tiburon Laboratory; Izadore Barrett, Murray Hayes, Dan Huppert, Dave Mackett, Rod McInnis, and Lillian Vlymen, NMFS, Southwest Center; C.E. Fullerton, Wes Silverthorne and Gary Smith, NMFS, Southwest Region; Gene Kruse, NMFS, Northwest Region; Al Millikan and Hank Wendler, Pacific Fishery Management Council; and Joe Easley, Oregon Otter Trawl Commission.
 - 16-17 - Sus Kato and Bill Leet traveled to Monterey to arrange collection of fish samples and to discuss a cooperative project on developing a fishery for euphausiids.
 - 22-23 - Sus Kato discussed alternative fisheries with fishermen and processors in Fort Bragg and Bodega Bay.
 - 23 - Ed Ueber met in Monterey with Frank Henry and Paul Wild, California Department of Fish and Game, to discuss the rockfish gillnet fishery.

- 24 - Mickey Eldridge presented a lecture and gave a tour of the Tiburon Laboratory to students and faculty from the Department of Fisheries, Humboldt State University.

PERSONNEL

Honolulu Laboratory

- February 1 - Gregory M. Weber, Biological Laboratory Technician (Fisheries) - Full-Time, Temporary Appointment.
- 5 - Elizabeth F.Y. Young, Editorial Clerk - Promotion.
- 13 - Serena P. Fujikawa, Clerk-Typist, Part-Time, Temporary Stay-in-School Appointment.
- 14 - David K.H. Louie, Computer Assistant - Part-Time, Temporary Appointment.
- 20 - Brent M. Miyamoto, Computer Assistant - Extension of Temporary Appointment.
- 21 - Gary D. Stephens, Computer Clerk - Part-Time, Temporary Appointment.
- Brian M. Yoshii, Computer Clerk - Part-Time, Temporary Appointment.
- 27 - Julie J. Eliason, Biological Technician (Wildlife) - Full-Time, Temporary Appointment.
- Alan K.H. Kam, Biological Technician (Wildlife) - Full-Time Temporary Appointment.

La Jolla Laboratory

- February 1 - Brian Edwards, Industry Economist - Entered on Duty.
- 5 - Cindy Thompson, Industry Economist - Entered on Duty.
- 6 - Marian Ray, Library Technician - Extension of Appointment.
- 7 - Sandy Hawes, Wildlife Biologist - Extension of Appointment.

- 9 - Solita Barrera, Computer Assistant - Resignation.
- 16 - Jean Michalski, Technical Publications Writer-Editor - Entered on Duty.
- 19 - Paul Fiedler, Oceanographer - Entered on Duty.
- 20 - Chuck Kokes, Biological Technician - Entered on Duty.
- 21 - Patricia Metcalf, Clerk-Typist - Resignation.
- 27 - Virginia Cass, Fishery Biologist - Extension of Temporary Appointment (Intermittent).
- Huong Bui, Computer Clerk - Stay-in-School Appointment.
- Lisa Hellmann, Computer Clerk - Stay-in-School Appointment.

Pacific Environmental Group

- February 27 - Susie Sanchez, Part-Time Appointment, Stay-in-School Program.

Tiburon Laboratory

- February 5 - Sharon L. Moreland, Biological Technician - Conversion to Temporary Appointment.
- 17 - John Chioda, Laborer - Termination.

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